

UNITED STATES DEPARTMENT OF AGRICULTURE

Soil Survey
of
Queen Annes County, Maryland

By

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and

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Bureau of Chemistry and Soils

In cooperation with the
**Maryland Geological Survey and the Maryland Agricultural
Experiment Station**

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SOIL SURVEY OF QUEEN ANNES COUNTY, MARYLAND

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COUNTY SURVEYED

Queen Annes County is in that part of Maryland known as the Eastern Shore. It is the third county south of the Pennsylvania State line (fig. 1). It is bordered on the east by the State of Delaware and on the west by Chesapeake Bay. Centerville, the county seat, is 65 miles southwest of Wilmington, Del., and 110 miles southwest of Philadelphia. Baltimore lies across the bay, a distance of about 50 miles to the northwest. The county is irregular in outline and includes an area of 241,280 acres, or 377 square miles.

Queen Annes County lies wholly within the Atlantic Coastal Plain. The general surface features consist of two almost level plains with a gradual rise from the foreland areas in the southwestern part of the county to the higher level in the northern part. Most of the county is completely dissected, although there are many areas where the streams have not cut channels deep enough to lower the ground-water level to a depth of 3 feet below the surface, and in some places water stands on the surface. The topographic features vary from the nearly flat low foreland country bordering Chesapeake Bay and its estuaries, including Kent Island and the area on both sides of Wye River, to the gently and moderately rolling or undulating upland plain. The break between these topographic divisions is not abrupt but is a gradual rise of the lower foreland toward the upper plain, the two divisions blending in gentle slopes. The greater part of the county, or the true lower level, lies at an elevation of less than 20 feet above sea level, and part of it is only a few feet above the tidal wash. For the most part the surface relief is flat, and in some places it is undulating. This foreland country has been indented by streams and bays branching off from Chesapeake Bay, which have divided this part of the county into long narrow peninsulas and islands, making travel by land circuitous. Along Chesapeake Bay and its larger estuaries the waves are cutting back the shore line, in some places as much as 20 feet a year. The eroded material is carried to more protected places and deposited, eventually forming marsh.

The shore line is very irregular, and one might think that this foreland country is marshy and unfit for cultivation, but, on the contrary, only a very small proportion of it is marshland, the largest area of this material being at the narrows where Kent Island is cut off from the rest of the county.

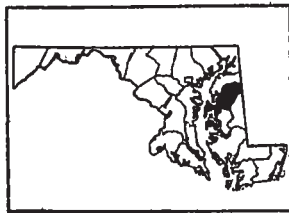


FIGURE 1.—Sketch map showing location of Queen Annes County, Md.

The upland plain, or four fifths of the county, ranges from gently or moderately rolling and undulating to nearly level in the north-central part. Most of this area is naturally well drained, and it lies well for the use of modern farm machinery. The elevation reaches 88 feet above sea level in the northern part. There is considerable country in the extreme northeastern and eastern parts of the county where the nearly flat surface is broken only by low ridges, mounds, and basinlike depressions. In this section the streams have not cut any channels, and this accounts largely for the poor drainage existing in the intervening flat lands.

The channels of the main upland streams increase gradually from mere shallow drainageways near the interior to comparatively deep valleys toward Chesapeake Bay or the rivers. The sides of a few of the valleys are rather steep, but very little erosion has taken place. The general arrangement of the drainage is dendritic and affords good drainage for the greater part of the county.

The small streams are bordered by narrow strips of low wet land, extending from mouth to source in the uplands, where rather large areas of flat, poorly drained land, in some places semiswampy in wet seasons, occur. Most of the streams are sluggish.

Practically all the native timber is on the poorly drained soils and along some of the slopes of the well-drained areas. The original forest growth consisted chiefly of white oak, pin oak, red oak, sweetgum, black gum, and maple, together with an underbrush of huckleberry on the poorly drained soils which are scattered throughout the county. Most of the second growth in once-cleared areas is sweetgum. The original trees on the well-drained brown soils were oaks, hickory, chestnut, dogwood, holly, beech, and loblolly pine. The second growth on the sandier areas in the northern end of the county consists mostly of scrub pine, with some loblolly pine. The forest growth on the flat light-colored poorly drained soils is fairly open, whereas the black poorly drained areas in the eastern part of the county are covered with a thick undergrowth of bushes and briers. The strips of wet land along the streams support a growth of birch, willow, alder, sycamore, elm, and swamp maple, together with water-loving shrubs, weeds, and briers.

The main species of grasses are sedges, poverty grass, cheat, wild-rye, wild oats, rush grass, and skeleton grass. Goldenrod is the predominating weed on poorly drained light-colored soils, and spirea, or hardhack, grows in most places on the poorly drained black land. Milkweeds, Queen-Annes-lace, or wild carrot, and the skeletonweeds take possession of the tame-grass meadows about every third year.

Queen Annes County was organized under the provincial government of Maryland in 1706, when it was separated from Talbot and Kent Counties. Active settlement began about the middle of the seventeenth century. Most of the earlier settlers came from England, and the present population is largely of English descent. The Toleration Act of 1649 attracted a number of religious refugees from Virginia and New England. Most of the early colonists settled near the navigable waters, as transportation and travel at that time were mainly by water. At present the population is fairly evenly distributed over the county, except in the northeastern part which is less thickly settled.

Centerville, the county seat and largest town, Stevensville, Queens-town, Church Hill, Sudlersville, Grasonville, Chester, and Crumpton are the most important towns. The 1930 census reports a population of 14,571, all classed as rural.

The Pennsylvania Railroad furnishes the transportation by land for the entire county. Steamboat lines are accessible from several points along the bay, estuaries, and Chester River on the western and northwestern sides of the county, and many gasoline or sailing freight-carrying vessels ply between the various landings and Baltimore.

The farmhouses and outbuildings are substantial, and the fields are well fenced. The highways are excellent in the summer and for the most part good in the winter. Churches and schoolhouses are conveniently located, and telephone lines reach practically every section. A number of canning factories are well located near railroad stations and boat landings. A large part of the milk and other products is shipped to Philadelphia and New York, and a small quantity to Baltimore.

CLIMATE

The climate of Queen Annes County is reasonably mild. The summers are not excessively hot, and extremely cold spells during the winter are of short duration. Table 1, compiled from records of the United States Weather Bureau station at Sudlersville, in the northeastern part of the county, gives the more important climatic data.

TABLE 1.—*Normal monthly, seasonal, and annual temperature and precipitation at Sudlersville, Queen Annes County, Md.*

[Elevation, 65 feet]

Month	Temperature			Precipitation			
	Mean	Absolute maximum	Absolute minimum	Mean	Total amount for the driest year (1914)	Total amount for the wettest year (1902)	Snow, average depth
	°F.	°F.	°F.	Inches	Inches	Inches	Inches
December.....	35.4	70	-4	3.91	8.01	6.21	5.4
January.....	33.7	74	-10	3.30	3.91	4.25	6.5
February.....	33.6	72	-12	3.26	2.95	6.85	6.5
Winter.....	34.2	74	-12	10.47	11.87	17.31	18.4
March.....	43.0	90	2	4.00	3.44	3.30	4.0
April.....	53.2	94	23	3.61	3.07	3.90	.9
May.....	63.6	97	32	3.49	2.33	2.28	0
Spring.....	53.8	97	2	11.10	8.84	9.48	4.9
June.....	70.9	102	42	3.85	1.35	9.00	0
July.....	78.2	105	49	4.72	4.28	3.75	0
August.....	74.0	103	47	4.52	4.04	1.57	0
Summer.....	73.7	105	42	13.09	9.67	14.32	0
September.....	68.0	95	34	3.60	1.49	6.68	0
October.....	57.7	89	26	3.14	1.63	4.97	0
November.....	45.3	78	16	2.64	2.16	3.68	.4
Fall.....	57.0	95	16	9.38	5.28	15.33	.4
Year.....	54.5	105	-12	44.04	35.66	56.44	23.7

Probably the precipitation is somewhat greater and the temperature milder on Kent Island and near the large streams and estuaries in the southwestern part of the county than in other sections. The rainfall is fairly well distributed throughout the year, being heaviest during the main part of the growing season—June, July, and August. Dry periods in late summer and fall interfere seriously with the preparation of land for wheat.

The average frost-free period, between the last killing frost (Apr. 15) and the earliest (Oct. 23), is 191 days, which is ample time for the maturing of all crops adapted to this section. The latest killing frost recorded was May 12, and the earliest October 7. At times spring frosts damage the crops. The ground rarely freezes to a depth exceeding 5 inches. Very little damage is done to wheat or other small-grain crops by heaving.

The prevailing winds are from the south and southwest during the summer and from the northwest and north during the winter.

The climate, as a whole, favors the production of wheat, corn, and hay, as well as asparagus, sweet corn, tomatoes, English peas for canning, and special crops, such as cantaloups, cucumbers, and many different vegetables. Cattle are grazed from the last of March until the middle of November.

AGRICULTURAL HISTORY AND STATISTICS

Agriculture has been the principal pursuit in Queen Annes County since its earliest settlement. At first tobacco was grown almost to the exclusion of other crops, and was long the medium of exchange. In the early days hardly enough corn and wheat were grown for subsistence of the colonists, but an act was passed in 1669 which provided that every taxable person should grow at least 2 acres of corn or be subject to a fine. During the Revolutionary War the farmers were cut off from the English market for their tobacco, and they were forced by necessity to turn their attention to other crops. They discovered that Queen Annes County soils were best adapted to the production of wheat and corn, and after the Revolution, unlike the farmers of other parts of Maryland, they did not go back to growing tobacco. Prior to the Revolution, however, the farmers had begun to realize that their lands were being depleted of organic matter by growing one crop all the time. It was about this time that the present 3- and 5-field system of cropping appeared. Sweetpotatoes have been grown on a very small scale since the early days. At one time, about 40 or 50 years ago, peaches were an important crop. In 1889 there were 1,287,496 peach trees which produced 177,068 bushels, but there are now no commercial orchards. Cultivation of tomatoes for canning purposes began about 60 years ago.

According to the United States census reports, the production of oats has steadily decreased, and this crop does not occupy an important place in general agriculture. The production of wheat increased until 1924 when the acreage dropped off about 10,000 acres. The acreage in corn has remained about the same since 1889.

Wheat and corn have been the dominant crops for a long time, and they still rank first in importance. Table 2 gives the acreage and yields of the principal crops for the years 1879, 1889, 1899, 1909, 1919, 1924, and 1929.

TABLE 2.—*Acreage and production of principal crops in Queen Annes County, Md., in stated years*

Year	Wheat		Corn		Hay	
	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Bushels</i>	<i>Acres</i>	<i>Tons</i>
1879.....	41, 229	558, 353	38, 653	934, 831	2, 891	3, 033
1889.....	40, 313	835, 478	34, 639	729, 725	7, 044	9, 784
1899.....	55, 278	972, 640	36, 973	1, 130, 740	4, 208	4, 214
1909.....	56, 249	746, 371	35, 123	987, 782	8, 225	8, 534
1919.....	56, 508	569, 361	35, 972	914, 972	13, 776	15, 979
1924.....	46, 693	733, 891	31, 008	677, 514	15, 953	18, 449
1929.....	48, 647	893, 955	28, 813	580, 003	18, 364	14, 492

The alfalfa acreage has increased from 42 acres in 1909 to 1,394 acres in 1929.

At present the dominant agriculture is general farming, consisting mainly of the production of wheat, corn, hay, and livestock, supplemented by dairying, poultry raising, and the growing of vegetables for canning. More sheep and turkeys are raised than in any other county in the State. Tomatoes are an important crop on almost every farm. Tomatoes, sugar corn, garden peas, and beans are grown for canning, and a few peaches, pears, asparagus, strawberries, and grapes are produced for market. Hogs are raised to supply the home and local-market demands, and poultry and sheep are considered important additions to general farming. Practically all the work animals are raised on the farm.

According to the 1930 census, 1,126 farms in the county used fertilizer (including commercial fertilizer, manure, marl, lime, and ground limestone) in 1929, with a total expenditure of \$231,294, or \$205.41 a farm. Practically all the commercial fertilizer is bought ready mixed. The formulas in general use for wheat are 1-9-3,¹ 0-12-5, and 0-12-6. Tomatoes, canning peas, beans, and asparagus receive a higher grade, such as 4-8-4. The farmers plan to give their land an application of barnyard manure once in 5 years. The plan of a 5-field system is to manure one field each year.

Nearly 1,000 farms reported an expenditure for labor in 1929 amounting to a total of \$452,176, or an average of \$462.82 a farm.

Nearly 90 percent of the land in Queen Annes County is in farms. The number of farms has increased from 1,279 in 1880 to 1,464 in 1930, and the average size has decreased from 169 to 143 acres within the same period. The farms range in size from 3 acres to 1,000 acres, and 4 farms in the county include more than 1,000.

Of a total value for farm property (\$17,638,885), land represents 40.7 percent; buildings, 38.9 percent; implements and machinery, 5.9 percent; and domestic animals, 14.5 percent. The average value of all farm property a farm is \$12,048.

Of the 1,464 farms in the county, 53.3 percent are operated by owners, 42.1 percent by tenants, and 4.6 percent by managers. Most of the tenant farms are operated on the share system.

All tenant farms are rented for a 1-year period.² The usual contract specifies that the landlord shall receive half the wheat, corn, tomatoes, and sweet corn. He provides the farm and buildings, pays

¹ Percentages, respectively, of nitrogen, phosphoric acid, and potash.

² Information on terms of rental were furnished by E. W. Grubb, county agricultural agent.

the taxes and insurance, and is supposed to keep up repairs. The tenant pays for all labor and receives half the grain and truck crops produced and all the dairy and other livestock and poultry products. He furnishes half the fertilizer and seed used except in the production of tomatoes, in which case he either furnishes all the picking expense and no fertilizer or half the picking expense and half the fertilizer. The surplus hay, according to the contract in common use, is divided equally between landlord and tenant, but there is seldom any surplus for sale.

Although no figures are available to show conclusively the drawbacks in the present leasing system, there is a feeling among the landowners that the system is deplorable. Unquestionably, an unfair division of returns exists, which is evidenced by a total lack of desire on the part of the tenant to own his own land. Although for business reasons few tenants care to admit that their share exceeds that of the owner, many candidly state that they propose to continue renting land on the present basis.

The results of such a system are very evident. The owner of the farm does not receive sufficient return to warrant keeping the property in repair, and buildings and fences are consequently dilapidated. The tenant, realizing that his tenure may last only 1 year, has little or no interest in maintaining or improving the quality of the land. The present system is hard on the tenant, harder on the landlord and hardest on the land.

The present leasing contract came into existence about 30 years ago when the farmers as a whole discarded fruit growing as a major enterprise and began to engage in grain farming. A later change from grain farming to a combination of grain and dairy farming, now practiced, was not accompanied by suitable changes in the rental contracts. The result of this is that nearly all the farms are dairy farms operated on a contract arranged to divide equitably the proceeds of a grain farm.

The farm buildings, as a rule, consist of well-built residences (many of which are old brick houses) and substantial barns. Nearly every farm is equipped with modern machinery and good tools. The work animals are medium-sized horses and mules. Most of the land breaking is done by tractor, especially on the owner-operated farms. A few combines for harvesting wheat are in use. Practically all the cattle are grades of the Holstein-Friesian breed. The number of cattle, horses, mules, and hogs has decreased in the last 10 years.

Dairying is the most important agricultural industry; livestock raising is also important. Practically all the turkeys raised are shipped to Philadelphia and New York; milk is shipped to Philadelphia; and most of the hard crabs are sold in Philadelphia and Baltimore.

SOILS AND CROPS

Queen Annes County, which is in the northern part of the Eastern Shore of Maryland, borders Chesapeake Bay and extends eastward to the Delaware State line. About 70 percent of the total area is being farmed or used for pasture. In fact, practically all the well-drained soils are thus used. Some of the unused areas support a second growth of trees, mainly hardwoods, together with a few

scattered pines. Only a very small quantity of the original or merchantable timber remains.

The various soils bear a closer relationship to the surface features and drainage conditions than to the underlying materials. All the soils are derived from beds of unconsolidated sands, sandy clays, and gravelly sandy material. Through the long process of weathering these materials have been acted on by drainage, aeration, and oxidation of some of the mineral elements, resulting in two main classes of soils—brown well-drained soils, including the Sassafras and Keyport soils, and poorly drained light-colored or black soils, including the Elkton and Portsmouth soils.

Good drainage, aeration, and oxidation in the Sassafras soils have been induced to a large extent by the presence of gravelly and sandy materials which commonly underlie all these soils at a depth ranging from 30 to 40 inches. The higher position of these soils favors this condition, as the Elkton and Portsmouth soils generally lie at much lower elevations, and the streams have not invaded those areas sufficiently to produce good surface drainage. In many places the poorly drained soils have a sandy substratum at varying depths.

The soils of the Sassafras series dominate the agriculture in the Eastern Shore of Maryland, in Delaware, and in southern New Jersey. Fortunately, Queen Annes County has a high percentage of Sassafras silt loam and Sassafras loam—the heavier soils of the series. These soils rank high as producers of wheat, corn, and hay crops. The farmers have apparently worked out a system of agriculture that fits well with the soils and climate. Convenient markets have been an important factor in the development of the dairy industry.

Dairying is one of the main agricultural pursuits and furnishes considerable income to the farmers. Wheat is also an important cash crop. The extensive areas of Sassafras silt loam and Sassafras loam, under a favorable climate giving a long season for grazing, are not only well adapted to the production of staple crops but also to the production of pasture grasses for hay and grazing. These soils have long been devoted to the growing of wheat, and the lighter textured soils are well suited to truck crops. A large revenue is derived from the sale of tomatoes, sweet corn, peas, and other truck crops for canning purposes, and a large number of sheep, hogs, turkeys, and chickens are raised and sold.

Over the greater part of the county a direct relationship exists between the agriculture and the various soil types. Considering the soils, climate, markets, and transportation facilities, the farmers are free to grow any crops adapted to this section, but they confine their operations to those crops which can be grown with least expense and which bring in the greatest cash income directly or indirectly.

The various soils of Queen Annes County can, according to their physical characteristics based on agricultural use, be placed in the following groups: (1) Brown well-drained soils, (2) light-gray poorly drained soils, and (3) black poorly drained soils.

In the following pages of this report the soils of Queen Annes County are described in detail, and their agricultural importance is discussed; their distribution is shown on the accompanying soil map. Table 3 gives their acreage and proportionate extent.

TABLE 3.—*Acreage and proportionate extent of soils mapped in Queen Annes County, Md.*

Type of soil	Acres	Per-cent	Type of soil	Acres	Per-cent
Sassafras loam.....	52,736	21.8	Elkton silt loam.....	34,432	14.3
Sassafras silt loam.....	43,968	18.2	Elkton loam.....	10,496	4.3
Sassafras sandy loam.....	24,064	10.0	Elkton sandy loam.....	1,408	.6
Sassafras sandy loam, steep phase.....	448	.2	Portsmouth loam.....	5,184	2.1
Sassafras fine sandy loam.....	2,616	1.2	Portsmouth sandy loam.....	960	.4
Sassafras loamy sand.....	2,304	.9	Meadow.....	12,480	5.2
Sassafras sand.....	1,068	.4	Tidal marsh.....	5,696	2.4
Keyport silt loam.....	31,488	13.0	Tidal marsh, high phase.....	64	.1
Keyport loam.....	8,128	3.4	Total.....	241,280	-----
Keyport loam, mixed phase.....	1,600	.7			
Keyport sandy loam.....	1,920	.8			

BROWN WELL-DRAINED SOILS

The brown well-drained soils occupy 70.6 percent of the entire area and on them practically all the crops are grown. These soils include all the types of the Sassafras and Keyport series and are representative of the choice agricultural lands of the Eastern Shore of Maryland, Delaware, New Jersey, and Virginia. They occur in large areas extending from Wye Mills in the southern part of the county to Chester River on the northern boundary, north of Sudlersville and Kent Island, and also have a general distribution elsewhere. The surface relief ranges from nearly level to undulating and gently rolling—features favorable to the use of modern machinery. Good houses and barns, indicating prosperous farmers, are in evidence nearly everywhere on these soils.

The growing of staple crops, dairying, and livestock raising in Queen Annes County is due mainly to the predominant heavy texture of the soils and to economic conditions. In this respect it is unlike Caroline County adjoining, where most of the soils are sandy and are adapted to growing truck crops.

These soils are naturally well drained both in the surface soil and subsoil. Practically everywhere there is a stratum of loose sandy material underlying the subsoil, which allows good under-drainage as well as perfect drainage for the entire soil. These favorable conditions, the brown color of the surface soil and the reddish-brown subsoil, indicate the most productive soils of the county. A good tilth is comparatively easy to obtain even on the heavier soils.

The Sassafras soils are brown, light brown, or grayish brown in the surface soil and have reddish-brown or yellowish-brown subsoils. They range in texture from sand to silt loam, the dominant types being the silt loam and the loam. The surface soils are friable and mellow, and the subsoils are sandy clay or clay loam, except in the sandy areas, where sand predominates. The subsoils retain soil moisture and plant food well, and the Sassafras soils rarely suffer from drought. Land that has been in grass for a long period, manured, or where cover crops have been turned under, contains considerable organic matter in the surface soil.

The Keyport soils occupy an intermediate position between the well-drained Sassafras soils and the poorly drained Elkton soils. These soils have not been quite so desirable for as wide a variety of crops as the Sassafras soils. They are not quite so well drained as the

latter but are better drained than the Elkton. Their agricultural value more closely approximates that of the Sassafras soils than that of the Elkton.

The soils of this group, except the small areas of sand and loamy sand, are naturally productive, the physical properties are such that they respond readily to the application of manures and fertilizers, and the effect of turning under green-manure crops is fairly lasting.

Practically all the Sassafras loam and Sassafras silt loam are being farmed. The remaining forest growth occurs as small wood lots and along the edges of fields near meadow areas along the streams. It consists mainly of red, black, and Spanish oaks, poplar, dogwood, hickory, beech, maple, and cedar, together with a few loblolly pine, locust, sweetgum, and black gum, and an undergrowth of sassafras and myrtle. Sassafras, chestnut, and second-growth pine constitute the principal covering on the unused sandier areas. The principal crops grown are wheat, corn, hay, and canning crops.

The common grasses in cultivated fields are Bermuda grass, crab-grass, and foxtail. Cheat, wild oats, and sedge grass grow around the edges of fields. Numerous species of sedges grow in almost every section of the county, both on poorly drained and on dry land. The most common is broomsedge, which usually grows in abandoned fields. Many different kinds of grasses grow, and numerous species of weeds thrive on all the soils. Most of the goldenrod grows on the poorly drained land. A few of the common grasses are poverty grass, skeleton grass, silvery hairgrass, and Indian grass. Coarse and fine marsh grasses and cattail grow in marshy places. The grasses return good yields and seem to be the best crops to grow under present economic conditions. However, on these brown well-drained soils, tobacco would do well. The Maryland tobacco is noted for its burning qualities and usually sells for a good price. Requirements necessary for better yields are change in the rental system, incorporation of more organic matter in the soil, application of more lime, and deeper plowing. These soils are slightly acid.

In Queen Annes County the brown well-drained soils group includes 7 Sassafras soils and 4 Keyport soils.

Sassafras loam.—Sassafras loam is the most extensive and one of the most important soils in Queen Annes County. The silt loam is equally important agriculturally and occupies almost as large an area. These are the best two general-purpose soils in this section of the country and are especially adapted to the production of the staple farm crops. Excellent yields of tomatoes, sweet corn, and peas are also obtained.

Sassafras loam occupies large bodies throughout the county, the largest occurring in the vicinity of Church Hill, east of Hackett Corners, southeast of Queenstown, north and southeast of Centerville, on Spaniards Neck, and at Carville. Numerous smaller areas are scattered over the county.

The surface soil of Sassafras loam is grayish-brown or light-brown mellow friable loam ranging from 7 to 14 inches in thickness. The subsoil to a depth ranging from 28 to 35 inches is reddish-brown or yellowish-brown sandy clay or clay loam. It retains moisture well but at the same time is friable and crumbly. It allows good drainage. The subsoil grades into sandy loam, thence into loamy sand

which is usually lighter in color. Underlying this is the characteristic sandy and gravelly material which affords complete drainage.

Sassafras loam is used mainly for the production of wheat, corn, and hay, in connection with dairying, and some is used for pasture. Alfalfa, clover, sweet corn, soybeans, and tomatoes are profitably grown. Approximately 95 percent of the land is under cultivation. Wheat yields from 20 to 40 bushels an acre, corn from 30 to 70 bushels and grass from 1 to 2 tons of hay. Yields of alfalfa range from about 3 to 5 tons an acre; of sweet corn, from 2 to 4 tons; and of tomatoes, from 4 to 10 tons.

Sassafras silt loam.—Sassafras silt loam differs essentially from Sassafras loam in that both surface soil and subsoil contain a higher proportion of silt. The surface soil when dry has a smooth floury feel, and the subsoil is heavier in texture and more compact. In places the surface soil and subsoil are lighter brown than the corresponding layers of Sassafras loam.

This soil occurs in rather large bodies scattered throughout the county. It occupies smoother areas than any other Sassafras soil, usually the higher part of the interstream areas. The largest bodies are in the vicinity of Sudlersville, near Centerville, south of Brownsville, and southeast of Catlin. Numerous smaller areas are scattered over the greater part of the county.

This soil is well suited to dairying and livestock raising. Its nearly level surface is suited to the use of modern machinery, such as tractors and combines. Practically all the land, except a few wood lots, is under cultivation. The same crops are grown on this soil as on the loam, and yields are about the same, except in some places where yields of wheat and hay crops may be slightly higher on the silt loam.

Sassafras sandy loam.—Sassafras sandy loam occupies a smaller total area and is less important than Sassafras loam and Sassafras silt loam. The greater part of it occurs in the northern part of the county, the largest body lying in the vicinity of McGinnes, along both sides and near the mouth of Unicorn Branch, along Andover and Sewell Branches, in the vicinity of Church Hill, and around Wye Mills. Smaller bodies occur elsewhere, especially in the eastern part of the county. This soil is used principally for staple crops—corn, wheat, and hay—and rather large quantities of sweet corn, tomatoes, sweetpotatoes, watermelons, cantaloups, and strawberries are grown. The land is easy to handle and can be cultivated under a wide range of moisture conditions. It is well adapted to the production of truck crops.

The surface soil is brownish-gray or light-brown mellow and friable loamy sand or sandy loam to a depth ranging from 6 to 9 inches. Underlying this layer is brownish-yellow or yellowish-brown friable sandy loam extending to a depth of 16 or 18 inches. The subsoil to a depth ranging from 30 to 40 inches is reddish-brown friable sandy clay which is underlain by yellowish-brown sand and gravel. The friable subsoil and sandy substratum allow thorough drainage, yet the subsoil is sufficiently heavy to retain plant food and moisture.

About 90 percent of the land is under cultivation. Probably more fertilizer is used on this soil than on Sassafras loam or Sassafras silt loam, and crop yields are not so high. In some places, where a large

amount of organic matter has been incorporated, good crop yields are obtained. Tomatoes and sweet corn give the best returns.

Sassafras sandy loam, steep phase.—Practically all the steep phase of Sassafras sandy loam is in forest. This soil differs from typical Sassafras sandy loam only in that most of it is too steep for cultivation. If it were cleared and tilled to clean cultivated crops it would erode badly. In places where there is no timber growth the surface soil is washed off, exposing the reddish-brown subsoil, and in some places erosion has extended through the subsoil layer into the sandy and gravelly material. Small quartz gravel in varying quantities are scattered over the surface.

These steep areas are at present nonagricultural. The tree growth consists mainly of oaks, poplar, beech, hickory, dogwood, cedar, and maple, and a few pines. The best use of this land is for forestry and pasturage.

Sassafras fine sandy loam.—Sassafras fine sandy loam differs from Sassafras sandy loam only in that it contains more fine sand. The surface soil is mellow fine sandy loam, and the subsoil is reddish-brown friable fine sandy clay. Underlying the subsoil is yellow or brown loamy fine sand or loose fine sand, which insures good drainage. In places where the water table is high, the lower part of the subsoil is heavy and mottled.

This is an inextensive and relatively unimportant soil. It occurs mainly on the necks and water points lying below the 25-foot level. The largest areas are along Chesapeake Bay west of Stevensville and south of Normans, north of Warehouse Creek on Kent Island, and on Parson Island. Several smaller bodies are on Piney Neck, Wye Neck, and Wye Island.

The soil is easy to cultivate, but it cannot be cultivated under so wide a range of moisture conditions as Sassafras sandy loam. Most of the land is under cultivation, and the same crops are grown and the same fertilizer practices prevail as on Sassafras sandy loam. Yields are slightly higher on the fine sandy loam, because the soil acidity seems to be counteracted by the deposits of shells in the soil.

Sassafras loamy sand.—Sassafras loamy sand is very inextensive in Queen Annes County and is therefore not an important soil. The surface soil is grayish-brown or dull-brown loamy sand to a depth ranging from 8 to 12 inches. It is underlain by brown or light reddish-brown loamy sand which at a depth of about 20 inches changes to heavy loamy sand or light sandy loam. This material extends to a depth ranging from 28 to 32 inches. Below this depth, in most places the sand becomes lighter in both texture and color, being brownish-yellow loose sand.

Practically all this soil occurs in the northern part of the county, along the south side of Chester River. The surface relief is gently rolling or undulating, and drainage is excellent. The soil is not suited to staple crops, and the areas are too small to justify truck farming on an extensive scale. The principal crops grown are sweet corn, sweetpotatoes, and tomatoes. Poultry raising is engaged in, and the soil is suited to peach growing. Heavy applications of manure and fertilizers and the incorporation of a good supply of humus are necessary to produce good yields on this soil. Less than half the land is cultivated, and the remainder supports a forest

growth consisting chiefly of second-growth pine, sassafras, chestnut, walnut, and locust.

Sassafras sand.—Small areas of Sassafras sand occur associated with Sassafras loamy sand on the south side of Chester River. The areas are too small to be of agricultural importance.

Sassafras sand is brown or yellowish-brown sand of uniform color to a depth ranging from 28 to 40 inches, where it passes into brownish-yellow loose incoherent sand. In places the surface soil is loamy sand.

Only a small proportion of this soil is farmed. Most of the cleared areas are cultivated in conjunction with Sassafras loamy sand or Sassafras sandy loam. The land is best suited to forestry.

Keyport silt loam.—The 7- to 10-inch surface soil of Keyport silt loam consists of grayish-brown or brownish-yellow compact silt loam which, when dug up dry, is mellow and has a floury feel. The subsoil is yellowish-brown silty clay streaked with gray, and when crushed has a more brownish yellow color. At a depth ranging from about 15 to 20 inches this layer is underlain by rather heavy silty clay, mottled yellow, brown, and gray, and this material, in turn, passes into gray, slightly mottled with brown, silt loam or fine sandy clay.

This soil is extensively developed on Kent Island, Wye Neck, and Wye Island. Bodies occur on both sides of Wye River, and along Chester River north of Queenstown. Numerous areas are scattered throughout the central, eastern, and southern parts of the county.

Some of the best dairy farms are located on Keyport silt loam. This soil is suited to the production of staple crops. Yields of wheat, corn, and tomatoes are only slightly less than on Sassafras silt loam, and the production of hay and soybeans equals that on the best Sassafras soils. In places on Wye Island the yields of wheat and corn are reported to excel those obtained on Sassafras loam or Sassafras silt loam. This is probably due to the presence of a high percentage of disintegrated oyster shells in the soil.

Because of its nearly level or undulating surface relief and fair drainage, this is just the kind of land for the use of modern machinery, especially tractors. The soil affords excellent pasture land for sheep and other livestock. Practically all the soil, except that along some of the drainage ways and the wood lots, is under cultivation. Barley does well.

Keyport loam.—Keyport loam occurs in comparatively small areas on Piney Neck, south of Ingleside, in several bodies in the southeastern part of the county north of Queen Anne, Talbot County, and on Kent Island, also in a few smaller areas in other sections. The surface soil is light-brown or brownish-gray loam, to a depth ranging from 7 to 9 inches, underlain by yellow or brownish-yellow fine sandy clay which extends to a depth of about 20 inches. The subsoil is yellowish-brown material mottled with gray, and it ranges from heavy clay to friable sandy clay in texture. Below this is grayish-yellow or mottled gray and yellow loamy sand.

About 75 percent of Keyport loam is under cultivation. Wheat, corn, and hay are the main crops, and the yields obtained are, as a rule, slightly less than those obtained on Sassafras loam. Tomatoes and sweet corn are also grown. This is a good all-round soil, but it is less important than Sassafras loam.

Keyport loam, mixed phase.—The areas mapped as a mixed phase of Keyport loam represent a soil condition rather than a soil type. Areas of Keyport silt loam, Keyport sandy loam, Elkton silt loam, Elkton loam, Sassafras loamy sand, Sassafras sandy loam, and Keyport loam are so intricately mixed, and the bodies of each are so small, that they could not be mapped separately. Keyport loam seems to predominate. This mixed soil occurs near Starkley Corner, Pondtown, and 1 mile west of Carson Corners. The total area is only $2\frac{1}{2}$ square miles.

In general the surface relief is that of a level plain with numerous shallow depressions, or swales, and little ridges and knolls. Corn, tomatoes, and soybeans are the main crops grown. As the soil areas are spotty, so also are the crops grown.

About 35 percent of this land is under cultivation; the remainder supports a mixed tree growth, almost every kind of tree common to the county being present.

Keyport sandy loam.—Keyport sandy loam differs essentially from Keyport loam in that it is more sandy in both surface soil and subsoil. The 8- to 12-inch surface soil is grayish-yellow or light-brown sandy loam. The subsoil begins as pale-yellow or brownish-yellow heavy sandy loam which within a few inches passes into mottled brown, yellow, and gray friable clay or heavy clay. This, in turn, is underlain by more sandy material. Along the Caroline County line at Templeville, also at Pondtown, are small spots of Keyport loamy sand, which, owing to their small extent, are included with the sandy loam. Here the soil material is lighter textured, that is, it contains more sand and is more porous and open than Keyport sandy loam.

Keyport sandy loam is one of the inextensive and relatively unimportant soils in the county. The largest areas occur on Spaniards Neck and around Starr. To the north and south of Grasonville are small included areas of Keyport fine sandy loam.

Probably 75 percent of the land is under cultivation to the same crops as those grown on Keyport loam, and yields of staple crops are slightly less than those obtained on the loam. Tomatoes yield equally as well as on the loam. This soil is easy to till, warms up quickly in the spring, and is better suited to early truck crops than Keyport loam or Keyport silt loam.

LIGHT-GRAY POORLY DRAINED SOILS

The second group, or the light-gray poorly drained soils, includes all the Elkton soils and may be termed the Elkton group. These soils occur in rather large bodies in both the foreland and upland sections of the county. The areas are scattered irregularly among the Sassafras, Keyport, and Portsmouth soils. Areas associated with the Sassafras and Keyport soils have a distinct surface relief, that is, practically everywhere they occur on the flat areas, in small shallow depressions, and near the heads of streams. In general, areas associated with the Portsmouth soils occur at slightly higher elevations than the Portsmouth soils. Therefore, the water table is lowered, and they are better drained than the Portsmouth soils.

Owing to their flat or depressed surface relief and to the heavy subsoil, the Elkton soils are naturally poorly drained. Artificial

drainage is necessary almost everywhere in order to reclaim these soils for agricultural purposes. Open ditches seem to be the best method of draining the land. Because of the heavy clay subsoil, the walls of ditches stand up well.

The Elkton soils are light colored, ranging from almost white to light gray in the silt loam areas and from light gray to gray in the loam and sandy loam areas. These soils are dominantly silty or heavy in texture, and the materials have a tendency to clod or run together. The subsoils consist of tough heavy plastic clay and heavy sandy clay, which are more or less mottled. The surface soils contain only a small amount of organic matter, except in some of the wooded areas, where there is a thin layer of leaf mold. All the Elkton soils are acid, and, as determined from a large number of lime tests, they require from 2,000 to 3,000 pounds of lime an acre to correct the acidity.

The Elkton soils are the most difficult soils in the county to handle. The range of moisture conditions is not so wide as in other soils. They have to be plowed and cultivated under proper moisture conditions. When either too dry or too wet the soil will break up into lumps, especially the silt loam which has a tendency to run together or compact. To handle these soils properly, stronger work animals and heavier machinery are necessary than on the lighter textured soils, but the same types of work animals and farm machinery are used on all the soils of the county. Heavy applications of manure, the incorporation of a good supply of any form of organic matter, and applications of lime would improve the physical condition of these soils. Chemical analyses show that they compare favorably with the Sassafras and Keyport soils as regards total content of plant food.

Less than 50 percent of the Elkton soils has been cleared, and not all the cleared land is being farmed. The uncleared areas support a tree growth consisting mainly of white, Spanish, and black oaks, maple, sweetgum, black gum, holly, and loblolly pine, together with an undergrowth of huckleberry and myrtle. A small amount of merchantable timber still remains.

In places Elkton silt loam and Elkton loam return fair yields of the staple crops. Tomatoes, sweet corn, beans, and soybeans give good yields. In some sections, where he does not have any Sassafras soil, the farmer is forced to use the Elkton soils for all crops. These soils are better suited for hay, soybeans, pasture, and sheep raising. With the present 5-year system of crop rotation, these soils are cultivated to the same crops as the rest of the farm. In some places, where the Elkton soils lie at slightly higher elevations and the water table is lowered, better crop yields are obtained.

Elkton silt loam.—The 5- to 8-inch surface soil of Elkton silt loam, locally known as "white oak land", consists of light-gray or grayish-white silt loam having a smooth floury feel. The subsoil is light-gray or bluish-gray plastic silty clay or clay loam, mottled with rust brown. At a depth ranging from 36 to 42 inches below the surface, the subsoil is underlain by light-gray friable silt loam or very fine sandy loam, mottled with brownish yellow.

The well-drained parts of Elkton silt loam, when limed and properly handled, produce good yields of wheat and grass. Timothy seems to be the best grass to grow, and soybeans the best legume.

Because of its heavy flourlike texture and tendency to run together when wet and to clod when dry, and also on account of poor drainage, this is a less desirable soil than Elkton loam or Elkton sandy loam. However, it can be improved by drainage and aeration, and the yields can be increased by continuously adding organic matter and lime.

This soil occupies low flat areas scattered throughout the county, except in the extreme northern part. The largest bodies are near Grasonville, south and north of Carville, south of Barclay, and around Brownsville.

Probably 30 percent of the land is cleared. Corn and hay are the principal crops, and some wheat is grown. A large acreage is used for pasture.

Elkton loam.—The greater part of Elkton loam occurs in the northeast section of the county, and small bodies are scattered throughout other parts.

The 7- to 10-inch surface soil is gray or light-gray loam. In places, adjoining the Portsmouth soils, it is dark gray or almost black. It is underlain by light-gray heavy loam or clay loam to a depth ranging from 12 to 20 inches. The true subsoil is light-gray, mottled with brownish yellow or rust brown, plastic heavy sandy clay or clay. The substratum, beginning at a depth ranging from 30 to 40 inches, is light-gray sticky sand or gray sandy and gravelly material.

Probably 60 percent of the land is cultivated or pastured. Staple crops, such as wheat, corn, and hay, return good yields on this soil. Tomatoes, sweet corn, beans, and soybeans do well. This is the principal agricultural soil in the northeast section of the county.

Elkton sandy loam.—Elkton sandy loam occupies a very small acreage and is an unimportant soil in Queen Annes County. The largest areas are near Carson Corners and west of Starr. A few smaller bodies occur elsewhere, most of them in the eastern part of the county.

This soil occurs in association with Elkton loam, Sassafras sandy loam, Sassafras fine sandy loam, and Portsmouth loam. It occupies flat areas or slight depressions. The surface soil is gray or dark-gray sandy loam. From a depth of about 8 inches to a depth ranging from 12 to 18 inches, the material is light-gray sandy loam or sticky sandy loam. The subsoil is gray or light-gray heavy plastic sandy clay or heavy sandy loam, mottled with yellow or rust-brown stains. The substratum, which begins at a depth ranging from 28 to 35 inches, is in most places gray sticky wet sand or sandy loam. A few small areas consisting of light-textured sand or loamy sand from the surface to a depth ranging from 40 to 50 inches are included with this soil in mapping.

Elkton sandy loam is used for practically the same crops and produces almost identical yields with those obtained on Elkton loam. The land is slightly easier to cultivate than the loam and warms up a little earlier in the spring.

BLACK POORLY DRAINED SOILS

The third group, or the black poorly drained soils, includes the Portsmouth soils and two miscellaneous classifications of material—meadow and tidal marsh, the latter with a high phase. Most of the

Portsmouth soils are in the northeastern part of the county; tidal marsh, with its high phase, occurs in the southwestern part; and meadow is distributed as narrow strips along the drainageways over all parts.

Owing to a high content of organic matter, the Portsmouth soils are black in their natural wet condition. These soils have remained in a swampy or semiswampy condition for a long time, vegetation has flourished, and the vegetable remains have accumulated in the surface soil to a depth of several inches. The soils occupy flat level areas or slight depressions where natural drainage has not been established. The black color of these soils, which in this respect resemble the prairie soils of the West, frequently misleads farmers in respect to their fertility. Only a very small proportion of these soils in Queen Annes County is under cultivation. The cultivated areas have been artificially drained by means of large open ditches.

Wheat, soybeans, and corn are the principal crops.

The Portsmouth soils are naturally sour, or acid, and they require a large amount of lime to correct the acidity. When drained, reclaimed, and limed they will produce good yields of corn and hay and furnish good pasture for cattle. The soils are loamy, being mellow, friable, and easy to cultivate. Because of their low, flat position, water stands on the surface longer than on the better drained soils. Owing to the high content of organic matter, these soils hold moisture very well, although they cannot be cultivated so soon after a rain as the Sassafras or Keyport soils.

Over the greater part of the Portsmouth soils, the original timber growth, or merchantable timber, has been cut, and there remains only a growth of black gum, sweetgum, red maple, pin oak, and willow oak, together with some holly, bay bushes, and smilax.

Portsmouth loam.—Portsmouth loam occurs in several rather large areas in the northeastern part of the county—north, south, east, and west of Carson Corners. The next largest areas lie south of Burrisville and south of Barclay.

The surface soil to a depth ranging from about 10 to 24 inches consists of black loam high in organic matter and in some places having a soft, mucky feel. The subsoil is light-gray or bluish-gray, mottled more or less with rust brown, heavy sandy loam or sandy clay, or light-gray clay which extends to a depth ranging from 30 to 36 inches, where it grades into light-gray compact sticky sandy loam or loamy sand. In a few places are spots of silt loam too small to be separated on the map.

Probably not more than 15 or 20 percent of Portsmouth loam has been cleared and cultivated. This soil, when well drained, is suited to the production of strawberries, blueberries, buckwheat, cabbage, and corn.

Portsmouth sandy loam.—The surface soil of Portsmouth sandy loam to a depth ranging from 6 to 16 inches is very dark gray medium sandy loam with a high content of organic matter. It is underlain by light sandy loam or loamy sand to a depth ranging from about 20 or 24 inches and grades into grayish-white or bluish-gray sandy loam or light sandy clay. In most places between depths of 30 and 36 inches the texture becomes lighter, and loamy sand or sticky sand is present in many places. This sandy substrata remains

saturated, except during extremely dry spells or where thoroughly drained.

The greater part of this soil occurs near the Delaware boundary. Other areas are along the Caroline County line and in the vicinity of Carson Corners.

The forested areas support a growth of sweetgum, black gum, beech, maple, and a few pine, together with a dense undergrowth of huckleberry, gall berry, and other bushes. Probably not more than one third of the land has been cleared and cultivated. When thoroughly drained, limed, and fertilized, excellent yields of strawberries, corn, dewberries, and in a few places cantaloups are successfully grown. Buckwheat and oats do fairly well, as do also onions and celery.

Meadow.—Meadow occurs as narrow strips, ranging from 100 to 400 or more feet in width, along the rivers and streams throughout the county. During the winter and early spring water stands on the land part of the time, but during the summer and fall the land is usually dry. The materials comprising meadow differ greatly in texture, color, and structure. These materials have been washed from the uplands and deposited by the streams. Some of the meadow areas would be fairly easy to reclaim by straightening and deepening the stream channels. When thoroughly drained, most of the land would return good yields of corn and hay. At present part of it is devoted to pasture for sheep, cattle, and hogs. The forest growth includes alders, sycamore, birch, elm, oak, pine, black gum, sweetgum, myrtle bushes, and in places an undergrowth of briers. The best use of meadow is for pasture and forestry.

Small areas of muck are included with meadow at the Caroline County boundary along the State road from Ingleside.

Tidal marsh.—Tidal marsh includes areas of both brackish- and fresh-water marsh. The areas are developed along Chester River and Eastern Bay, and on the shore of Kent Island fronting on Chesapeake Bay. Marsh also occurs on many inlets and estuaries to the bodies of water just mentioned. It lies near sea level and is subject to inundation by salt or brackish water at high tides. In most places the soil material is dark-gray or brownish-gray, slimy, oozy loam or silt loam. Many roots of marsh grass and much partly decomposed organic matter occur in the first few inches of the soil. In most places, at a depth ranging from 12 to 20 inches, the material grades into gray, rather heavy, silty clay loam containing some rust-brown mottlings. In places the surface material is underlain by sand or sand and gravel.

Tidal marsh supports a rank growth of marsh grasses and numerous sedges, also some ironweed, cow lily, arrowhead, waterhemp, and wildrice. The last-named plant has an economic value as food for ducks. Tidal marsh has no agricultural value except scant grazing for cattle.

Tidal marsh, high phase.—The high phase differs from typical tidal marsh in that the areas lie slightly higher and are not subject to daily inundation. It is covered by water at high tides or wind tides. Some of this high marshland supports a growth of coarse grasses that can be grazed or, in a few places, cut and used as packing material. In some places scrub pines are growing. Under present

conditions the only agricultural use for this land is for the scant pasture it affords.

AGRICULTURAL METHODS AND MANAGEMENT ^s

The agricultural experiment station of the University of Maryland has conducted experiments on several of the principal soil types represented in Queen Annes County, using fertilizer treatments with and without lime, in order to determine the most profitable way of handling the soils. The results show that in practically every case there is a slight response to nitrogen, a pronounced response to phosphorus, and very little gain with potash. Where an ample quantity of manure is used there seems to be very little, if any, advantage in using complete commercial fertilizers containing high quantities of nitrogen. Manure applied at the rate of 20 tons an acre in each rotation gives a decided increase in yield. The nitrogen contained in the manure is responsible for a part of this response, but the effect of the manure on the physical condition of the soil is probably the most important. However, it is not economical to apply more than 10 tons an acre in each rotation except for a few special horticultural crops. The best treatment seems to be manure at the rate of 10 tons an acre in each rotation, supplemented with phosphorus. The phosphorus should be applied at the rate of 80 pounds of phosphoric acid (P_2O_5) an acre for each rotation. This is equivalent to 500 pounds of 16 percent superphosphate (acid phosphate). The effects seem to differ very little whether rock phosphate or superphosphate is used as the source of phosphorus, provided sufficient manure is used. Lime should be applied in the soils when necessary, but it is advisable not to use it in excess. Organic matter in most areas is low and must be supplied either in the form of barnyard manure or green manure. Thus it is evident that rotations should be planned which provide for turning under at least one cover crop. To obtain the best results with either barnyard manure or green manure, phosphorus must be added either in the form of rock phosphate or superphosphate.

In the heavy soil types, such as Elkton silt loam, Sassafras silt loam, and Keyport silt loam, grain farming and dairying should be practiced. On these soils a rotation consisting of wheat, hay (clover and timothy), and corn, with a part of the cornland planted to tomatoes, is a satisfactory rotation. This rotation provides for keeping one fourth of the plowed land under cultivation each season. It is not advisable to have half the land planted to corn and tomatoes or other cultivated crops each season as is the tendency on some farms, as under such conditions it is very difficult to maintain sufficient organic matter in the soil. On dairy farms a special rotation consisting of corn for silage followed by winter barley and 3 or 4 years of alfalfa would prove satisfactory. On farms where this special rotation is used, it is usually best to select the required acreage from land located near the farm buildings, provided suitable soil drainage may be had. The total acreage necessary must be determined by the number of cows in the dairy herd, allowing 1 acre

^s This section of the report was written by O. C. Bruce, professor of soils, University of Maryland.

of alfalfa for each two dairy animals. If a 5-year rotation is practiced, three fifths of the land will be in alfalfa each season. One crop of alfalfa may be harvested after removing the barley crop. In the corn, wheat, and hay rotation, 500 pounds of 2-12-4 fertilizer, together with a liberal quantity of stable manure, for each rotation should be sufficient not only to maintain but also to increase the fertility of the soil. If additional nitrogen is needed for any crop, it should be added as either a top or a side dressing. Where tomatoes are grown in the rotation, from 500 to 800 pounds of 4-8-7 should be most satisfactory.

The important lighter textured soils are Sassafras loam, Sassafras sandy loam, and Sassafras fine sandy loam. These are best adapted to the growing of canning and truck crops. Unless a special canning-crop rotation is used, the same order of cropping as on the heavier soils might be practiced, except that tomatoes occupy a regular place in the rotation. A cover crop of crimson clover or vetch and rye, to be turned under for the corn, should be grown after the tomatoes. On some farms sugar corn is grown in the area ordinarily devoted to field corn. As with the heavier soils, constant attention should be given to the maintenance of the supply of organic matter in the soil. This means liberal use of manure and green-manure crops and the restricting of the cultivated area to not more than 33 percent of the total land farmed. The quantities of fertilizer recommended are as follows: For tomatoes, 500 pounds of 5-8-7; for sugar corn, 300 pounds of 4-8-5; and for wheat, 300 pounds of 2-12-4. These soils are also well adapted to the production of alfalfa, and in general the life of the stand ranges from 3 to 6 years.

According to E. W. Grubb, county agricultural agent, the best management for Sassafras silt loam, Keyport silt loam, Keyport loam, and the associated heavy-textured soils is a proper rotation combined with a general use of stable manure and an extensive use of lime. The humus content should be built up as rapidly as possible by growing more green-manure crops to be turned under. The depth of plowing should be increased until a depth of about 8 inches is obtained. The flatter areas should be adequately drained. An extensive use of soybeans cut for hay would materially improve the condition of the land, both mechanically and from the point of view of fertility. A survey conducted some years ago revealed the fact that practically all the soils of the county need lime. The lime requirement on these soils ranges from about three-fourths ton to $1\frac{1}{2}$ tons of burned lime an acre.

The soils are highly responsive to good treatment and in many places deserve far better handling than they now receive. There is a great lack of humus in the soils because of too close pasturing and a general neglect of green manuring. On some farms, where the land is operated by the owners, excellent results are being obtained through the proper treatment of the soils. The heavier soils produce the best yields of corn, oats, wheat, alfalfa, and clovers, and also some of the late truck crops. The lighter, sandy soils are best suited to fruits and vegetables. The adequate local facilities for handling the canning crops, such as tomatoes, string beans, asparagus, and peas, render farming on these soils profitable.

The soil materials comprising Elkton silt loam and Keyport silt loam are inclined to run together when wet and to bake or harden on drying. These soils are stiff and are not easily plowed or tilled unless the proper moisture condition is obtained, and their best use is for grass and pasture. As with other soils of the county, the best results are obtained by the addition of lime, heavy applications of manure, or turning under green-manure crops. Tile draining is recommended for some of the small areas which are now poorly drained. It is safe to state that the soils are capable of twice the yields now obtained from them.

SOILS AND THEIR INTERPRETATION

Queen Annes County, Md., lies in the northern part of the Eastern Shore of Maryland, in the Atlantic Coastal Plain region of the United States. The soils belong to the brown forest soils group. The soils, although belonging to the podzolic group, are not true podzols.

The soils have developed under a forest cover, mainly of hardwoods intermingled with some pine. As a result they are all light colored, except a few small areas of the Portsmouth soils, as conditions have not favored the accumulation of a large quantity of organic matter. However, in some of the forested areas, there is a slight accumulation of vegetable mold, leaves, twigs, and grass roots on the surface, and a small quantity of organic matter mixed with the first few inches of the soil. All the soils, except the Portsmouth, are low in organic matter.

All the soils range from slightly to strongly acid, except where the acidity has been neutralized by liberal applications of lime. The light-colored Elkton soils and the dark-colored Portsmouth soils are strongly acid.

As the rainfall is heavy and the temperature for the greater part of the year is mild, a large amount of the soluble salts has been leached from the surface soils, particularly in the more sandy textured soils and in the soils on the steeper slopes. Erosion has been active on the more rolling areas, and in many places a noticeable quantity of soil material has accumulated at the bases of the slopes as a result of sheet erosion.

There are two important groups of soils—the well-drained soils and the poorly drained. These soils correspond closely to two geologic formations—the Wicomico and the Talbot. The Wicomico formation covers the greater part of the county, that is, practically all except the southwestern part. This formation lies at higher elevations than the Talbot, and natural drainageways have penetrated practically all areas of it, thereby producing an undulating or gently rolling surface relief and good natural drainage. These conditions have favored aeration and oxidation and have allowed the development of normal soil profiles. Both the Wicomico and Talbot formations consist of unconsolidated beds of sands, clays, and sandy clays. The underlying beds of sand and gravel of the Wicomico formation have produced thorough oxidation of the iron salts, thus giving a reddish-brown color to the B horizon of the Sassafras soils in a region of dominantly gray soils. The Sassafras soils are derived from the Wicomico formation.

The Talbot formation, which is more recent than the Wicomico, underlies the marine terraces and flat forelands, which lie at an elevation ranging from about tidewater to about 20 feet above sea level. This formation underlies practically all of Kent Island and the southwestern part of the county on both sides of Wye River, and occurs to a very limited extent along the northeastern border of the county. Areas underlain by the Talbot formation are naturally poorly drained, owing to their flat surface and low position, and in many places the soils present the original constructional form as the material was laid down by the sea. Because of imperfect drainage, lack of aeration, lack of oxidation, and in places to the presence of beds of heavy sandy clays, normal soil profiles have not developed. The Elkton soils and the Keyport soils (in part) are derived from this formation.

The Sassafras soils express the normal characteristics and natural processes of weathering. In the B horizon, weathering is most complete, and uniform color and consistence have been produced in the Sassafras soils. The B horizon is the seat of deposition of the fine material carried from the layer above. It constitutes a reservoir for soil moisture and usually contains a higher percentage of potash than does the surface soil. Throughout the normally developed soils, there is considerable eluviation in the A horizon and illuviation in the B horizon.

A description of the profile of a sample of Sassafras loam collected one-half mile west of Centerville from a cultivated field represents the profile of the normally developed Sassafras soils and is as follows:

Horizon A. 0 to 9 inches, light-brown mellow and friable loam.

Horizon B. 9 to 80 inches, reddish-brown friable and crumbly sandy clay which breaks to irregular-shaped lumps and can easily be crushed, showing no definite breakage lines. This material is uniform in color, except where a few root holes have been lined with gray material.

Horizon C₁. 80 to 40 inches, yellowish-brown light sandy loam or loamy sand.

Horizon C₂. 40 to 60 inches, brownish-yellow sand containing a few small rounded quartz gravel.

In virgin areas the ½- to 1-inch surface layers of Sassafras loam and Sassafras silt loam are dark-gray material which is rather high in organic matter, and in some places a thin covering of leaf mold lies on the surface. Other members of the Sassafras series, as mapped in Queen Annes County, have similar color characteristics, but they differ from the loam in texture and structure, depending largely on the amount of fine material contained in the solum.

Occupying a position between the Sassafras and Elkton soils is an intermediate grade of material as regards color, drainage, and consistence in the B horizon. These conditions give rise to soils that have been grouped in the Keyport series. The soil profile is somewhat similar to that of the Sassafras soils throughout the A horizon which comprises the surface and subsurface layers. Horizon B, or the true subsoil, shows evidence of incomplete oxidation in its mottled gray, yellow, and brown color. It is heavier in texture, is tough, and in many respects resembles the subsoil of the Elkton soils. The mottled condition of the lower subsoil layer is not owing

entirely to the underlying material, but in part to the fact that oxidation has not yet extended below a depth ranging from 12 to 18 inches. Below the typical subsoil is the light-textured loose material of horizon C, or the parent material.

Following is a profile description of a sample of Keyport silt loam collected 1 mile northeast of Queenstown:

Horizon A. 0 to 9 inches, yellowish-brown or light-brown mellow and friable silt loam. A thin covering of grayish-brown leaf mold is present on the surface.

Horizon B. 9 to 20 inches, brownish-yellow silty clay or silty clay loam, mottled with light gray and brownish yellow. This material breaks into irregular-shaped lumps but is fairly easily crushed to a yellow or brownish-yellow mass. Some of the soil particles, or lumps, have a gray coating on the outside and are brown on the inside.

Horizon B₁. 20 to 30 inches, mottled light-gray and rust-brown rather heavy clay or silty clay, containing a strata of bluish-gray plastic clay and thin layers of brown fine sand.

Horizon C. 38 to 46 inches, light-gray very fine sandy loam faintly mottled with yellow and rust brown.

The Elkton soils, occupying low, flat, poorly drained areas, indicate that their profile development has been retarded or influenced by excessive moisture. In areas where surface drainage is imperfect and the soil has been subjected for long periods to the influence of excessive moisture and imperfect internal drainage during parts of the year and to conditions of deficient moisture during periods of dry weather—that is, to alternating wet and dry conditions—the surface soil is gray or nearly white. In a few forested areas some vegetable matter has accumulated on the surface. The main subsoil layer, or horizon B, consists of heavier material mottled gray, yellow, and brown. This layer varies in thickness and in structure, but in most places, at a depth ranging from 28 to 34 inches, it is underlain by material which is lighter in color and much more friable. The mottled color of the material throughout the entire profile bears evidence of incomplete oxidation.

A description of the profile of Elkton silt loam from a virgin area $1\frac{1}{2}$ miles north of Stevensville is as follows:

Horizon A. 0 to 5 inches, light-gray silt loam which is compact when dry but is mellow and friable under favorable moisture conditions. The material has a very floury feel.

Horizon B₁. 5 to 8 inches, light-gray heavy silt loam faintly mottled with rust brown.

Horizon B₂. 8 to 40 inches, light-gray silty clay mottled with rust brown. The material in this layer is rather heavy, slightly plastic clay and contains thin layers of gray fine sand and lenses of heavy plastic clay.

Horizon C. 40 to 50 inches, light-gray silt loam or heavy fine sandy loam, mottled with brownish yellow. This is the most variable part of the soil profile.

In areas where more or less swampy conditions have prevailed, decaying vegetable matter has accumulated in sufficient quantities to give the surface soil a black color, and these black soils have been classed as the Portsmouth soils. The subsoils are light-gray sandy clays or clays, mottled with rust brown and yellow. In places the B horizon may be a uniformly gray sandy clay or clay.

A description of a typical profile of Portsmouth loam, taken in a virgin area 3 miles southeast of Sudlersville, follows:

Horizon A. 0 to 12 inches, black loam containing a high percentage of organic matter.

Horizon B. 12 to 22 inches, light-gray friable sandy clay.

Horizon C. 22 to 40 inches, gray sticky sandy clay mottled with brownish-yellow or rust-brown streaks and carrying thin layers of gray fine sand. The clay has no definite breakage or structure.

A few gravelly areas are scattered over parts of the county. In many places the underlying parent material consists of stratified layers of quartz gravel and sand. There are a few gravel and sand pits in the county.

In addition to the well-defined soil types, there are two classifications of miscellaneous material—meadow and tidal marsh. Narrow strips of various-textured poorly drained first-bottom material, occurring along the small streams, is classed as meadow. Tidal marsh represents permanently wet material developed along Chesapeake Bay, estuaries, rivers, and at the mouth of some of the larger creeks.

SUMMARY

Queen Annes County lies on the Eastern Shore of Maryland, between Chesapeake Bay and the Delaware State line. It includes an area of 377 square miles. It is well located as regards transportation facilities. It is connected with Baltimore by water, Philadelphia and New York by rail, and all the large markets by hard-surfaced highways.

The surface relief over most of the county is level, undulating, or gently rolling, and the land is naturally well drained. The surface relief is suitable to the use of modern machinery, and the climate is mild and favorable to a wide variety of crops.

The soils of the county comprise two main groups—well-drained soils and poorly drained soils. The silt loam, loam, sandy loam with a steep phase, fine sandy loam, loamy sand, and sand members of the Sassafras series and the silt loam, loam with a mixed phase, and sandy loam members of the Keyport series are the well-drained soils. These soils range in texture from loose sand to heavy silt loam. They are all, except the small areas of loamy sand and sand, adapted to the production of staple crops. Sassafras silt loam, Sassafras loam, Sassafras sandy loam, Keyport silt loam, and Keyport loam are the main soils for the production of general farm crops, such as wheat, corn, hay, and tomatoes. These are among the most productive soils of the Atlantic Coastal Plain. Yields of wheat on Sassafras silt loam, Sassafras loam, and Keyport silt loam are equal to the production in any other county in Maryland. These soils are also suitable to dairying and livestock raising. The sandier soils are best for canning and truck crops.

The poorly drained soils of the Elkton and Portsmouth series have, over considerable areas, been drained, and where these adjoin the well-drained Sassafras or Keyport soils, they are cultivated to the same crops. The present 5-year system of rotation brings all parts of the farm in some crop every fifth year regardless of the soil type. In some places, the Elkton and Portsmouth soils are used for tomatoes and sweet corn. These soils furnish considerable grazing

for sheep and cattle. The uncleared areas supply the farmers with firewood, fence posts, and a few crossties.

Queen Annes County, owing principally to economic reasons and favorable soil characteristics, is devoted to the production of staple crops, dairying, and livestock raising. The county is first in the State in number of sheep. Poultry raising is also important, this county ranking first in the State in number of turkeys raised each year.

The county offers inducements to livestock raisers, dairymen, and persons desiring to fish, crab, or oyster. Crabbing, oystering, and fishing are important industries throughout the greater part of the year. The soils are some of the best in the State for general farming.



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